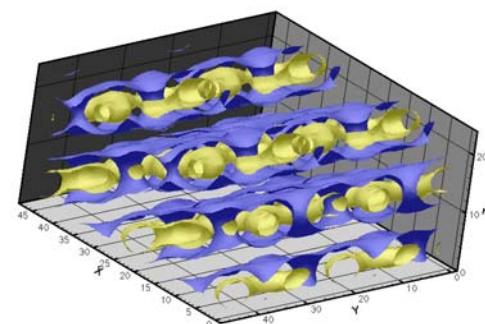
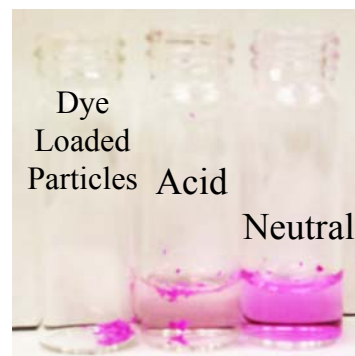
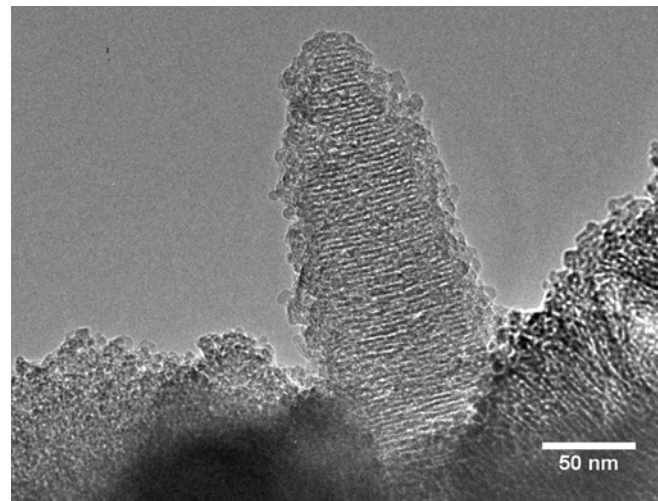


NIRT: Tailored Fluorinated Surfactants for the Design of Ordered Nanoporous Ceramics

S.E. Rankin and B.L. Knutson, University of Kentucky

H.J. Lehmler, University of Iowa, DMR-0210517

We combine chemical synthesis, materials synthesis and Monte Carlo simulations to develop ceramics with well-defined nanoscale pores by spontaneous assembly of ceramic precursors and surfactants. The fluorinated surfactants that we use are “non-stick” molecules (like Teflon[®]) and give smaller pores, new pore arrangements, and better processing strategies. In one application (lower left), we prepared functional particles that hold and protect a pink dye in an acidic environment, but release it when neutralized. Recent results have been published in *Langmuir* and *Micro-porous and Mesoporous Materials*.



Top: Transmission electron micrograph of elongated fluorinated surfactant-templated particles
Left: pH responsive particles loaded with colored dye
Right: Computer simulation of pore structure

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Outreach:

- Meetings with local industry participation:
 - Tristate Catalysis Society
 - Kentucky Nanomaterials Workshops
 - Innovation and Enterprise Conferences
- E-day Open House (2,000 K-12 students)
 - “Materials World” nanotechnology poster
 - Hands-on separation using porous particles
- Engineering camp for high school juniors
- Feature* in *ODYSSEY* magazine for local research community

Under Pressure UK scientists create tomorrow's materials with pressure, CO₂ and fluorinated surfactants



Education:

- In addition to graduate students and postdocs, 8 undergraduate students have participated in project
- One REU student
- Two RCTF Minority Scholars
- One undergraduate student co-authored a publication in print
- Two undergraduate students presented results at American Institute of Engineers National Meeting, Fall 2003
- One alumnus from project went on to become an NSF Graduate Fellow at University of Minnesota

*<http://www.rgs.uky.edu/ca/odyssey/spring03/underpressure.html>